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5 Title: High Reliability – Parallel Data Transfer Hard Disk Drive.

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14 **INFORMATION DISCLOSURE STATEMENT UNDER R37 C.F.R. 1.97**

15 In compliance with Applicant's and his attorney's duty of disclosure under 37 CFR
16 1.56, the Applicant does hereby submit the following Information Disclosure Statement,
17 Form PTO - 1449, and copies of the references listed thereon.

18 A patent search was manually conducted for the invention described in the above-
19 referenced patent application. In the course of the search, no patents were found for an
20 apparatus that has the same structural features or that operates in the same manner such as the
21 invention listed above. The following twenty-two (27) patents, however, were noted as being
22 of interest and are hereby brought to the Examiner's attention as references AA - AZ. The
23 significance of each listed reference is as follows:

1 AA. (U.S. Patent No. 4,754,353) entitled; Hard disk head positioner assembly, Levy,
2 date of patent: Jun. 28, 1988. A digital storage system of the Winchester or hard disk drive
3 type has a magnetic head positioner within which the arm-positioning body, including the
4 heads, is rotatably mounted about a fixed stator assembly which includes a two-part shaft
5 assembly comprising an aluminum cylindrical sleeve thermally shrink fitted about the central
6 portion of an aluminum shaft having a pair of fixed ends and end portions reduced in
7 diameter relative to the central portion by means of a pair of steel bearing assemblies
8 attaching circumferentially about the sleeve in regions exclusive of the shrink fitted central
9 portion of the shaft assembly. The clearance thus provided between the shaft and the
10 mounting sleeve in the regions of the bearing assembly attachment permits a degree of
11 decoupling of mechanical resonances potentially introduced into the head position
12 servocontrol loop by mounting stresses acting upon the shaft.

13 AB. (U.S. Patent No. 4,879,617) entitled; Actuator assembly for hard disk drives,
14 Sampietro et al, date of patent: Nov. 7, 1989. An actuator assembly for a disk drive system
15 includes an actuator pivotally mounted to a shaft, and a coil assembly. A counterbalance
16 portion of the actuator provides a recess wherein a portion of the coil assembly is slidably
17 inserted. The coil assembly includes a bobbin which has a dovetail portion having at least
18 two precision positioning surfaces which, when placed within the counterbalance recess,
19 interact with corresponding precision positioning surfaces provided within the counterbalance
20 recess. In order to accurately position the coil assembly with respect to the actuator, an
21 outward force is applied to the coil assembly perpendicular to the pivot axis to cause facing
22 pairs of the precision positioning surfaces of the coil assembly and the counterbalance recess
23 to bear against one another, and align a dowel/pin alignment passageway extending through

1 the counterbalance with a dowel/pin recess provided in the bobbin. A dowel is then placed
2 through the alignment passageway and into the dowel/pin recess to hold the actuator and coil
3 assembly in the preferred configuration while an adhesive is injected into the spacing
4 between the bobbin and the counterbalance recess. No adhesive is injected between the
5 precision positioning surfaces bearing against one another. The dowel is subsequently
6 removed and replaced by a stop pin.

7 AC. U.S. Patent No. 4,949,201) entitled; Disk drive head position controller with
8 static bias compensation and plural velocity detectors, Abed, date of patent: Aug.14, 1990.

9 A positioning system for a hard disk drive for rapidly and accurately positioning the disk
10 head. A constant bias compensation signal is injected into the feedback loop to reduce
11 positioning delays otherwise caused by a steady state force which is asserted against the head.
12 High and low velocity measuring techniques are also disclosed, along with several techniques
13 for advantageously injecting these measurements into the feedback loop at appropriate times.
14 An improved resonant filter is also disclosed.

15 AD . From(U.S. Patent No. 4,954,904) entitled; Method and apparatus for preventing
16 head crashes in a disk system, Goor, date of patent: Sept. 4, 1990. Improved apparatus and a
17 method are disclosed for controlling the flying height of a head over a rotating medium, such
18 as used in a rigid disk drive employing magnetic, magneto-optic or optical recording
19 techniques. The flying height is controlled via magnetic attraction or repulsion to maintain a
20 selected and substantially uniform flying height of the head with respect to the rotating
21 medium

22 AE. From (U.S. Patent No. 5,343,347) entitled; Magnetic disk storage module with
23 multiple sets of actuator arms for simultaneous read/write operations at different

1 circumferential locations within the disk stack, Gilovich, date of patent: Aug. 30, 1994.
2 A hard disk drive module for providing memory storage for a computer includes a centrally
3 positioned rotatable stack of disks and a plurality of rotary actuator arms mounting magnetic
4 heads for movement radially of the disks to read/write magnetically encoded data on each
5 surface thereof. The actuator arms which extend between adjacent spaced disks are provided
6 by plural-arm assemblies individually pivotally mounted at each of the four corners of the
7 module so that the radial tracking movement of the heads thereon occurs in angularly spaced
8 locations in the disk stack. Each actuator assembly is driven by a drive arm extending at an
9 acute angle with the longitudinal axes of the associated actuator arms so as to minimize the
10 required space on the module for the drive elements.

11 AF . From (U.S. Patent No. 5,675,452) entitled; Thin data storage device having a
12 flexible recordable disk and recording heads arranged on both sides of the disk, Nigam, date
13 of patent: Oct. 7, 1997. In one embodiment, the invention provides a thin data storage
14 device comprising a housing that has a top and a bottom cover and a printed circuit board
15 having electronic integrated circuits mounted thereon. A rotatable spindle is formed about a
16 cylindrical shaft and is rotatable by rotation means. A magnet structure is rigidly mounted to
17 a flange attached to the spindle. A stator is attached to the circuit board and comprises plates
18 of soft magnetic material having coils wrapped on legs of the stator. At least one flexible
19 recordable disk is non-removably mounted to the spindle. A top and a bottom recording head
20 is arranged on both sides of the disk. A woven liner is attached to the top of the circuit board
21 over the integrated circuits. A rotor is arranged on a second shaft at a point displaced from
22 the first shaft. The rotor is rotatable by a second rotation means configured to allow the rotor
23 to move relative to the disk. A coil of wire is attached to one side of the rotor and is displaced

1 in a magnetic field developed between a magnet structure mounted to a first soft magnetic
2 plate that is attached to the bottom cover and a second soft magnetic plate that is attached to
3 the top cover. A flexible printed circuit cable is attached to the circuit board and the rotor to
4 provide a path for electrical servo control and recording signals between the rotor coil,
5 recording heads and the circuit board.

6 AG. From (U.S. Patent No. 5,761,007) entitled; Disk drive with multiple actuators on
7 a single axis having different inertia characteristics, Price et al, date of patent: Jun. 2, 1998.

8 Disclosed is a data recording disk file having multiple actuators mounted on a common pivot
9 axis, one of the actuators having fewer arms and lower inertia characteristics than the other.
10 A servo system separately drives each of the actuators for seek repositioning, the lower
11 inertia actuator having a higher performance than the other. A controller selectively records
12 one type of data on the data surfaces associated with the lower inertia actuator, and records
13 all other data on the other data surfaces, thereby providing a disk drive with increased
14 performance appropriate to the data stored on the surfaces associated with the lower inertia
15 actuator. A removable locking pin may be provided which extends through corresponding
16 holes in each of the actuators for maintaining the actuators precisely positioned with respect
17 to each other so that servo information may be written on each of the surfaces in a single
18 process. Additionally, one of the actuators may be provided with a shorter stroke than the
19 other actuators. Further, the tracks of the data surfaces associated with one of the actuators
20 may have a different track pitch than the other data surfaces.

21 AH. From (U.S. Patent No. 5,836,205) entitled; Linear actuator mechanism, Meyer,
22 date of patent: Nov. 17, 1998. A linear actuator has four drive gears which engage two
23 racks. The actuator movable member may comprise two racks which have gear teeth which

1 face inwardly and towards each other, or a single rack which has gear teeth which faces
2 outwardly. In either case, four gear drives to engage the rack, two gear drives on each side. A
3 plurality of linear actuators may be used to provide for position control in two or more
4 directions. Control is provided by a servo mechanism.

5 AI. (U.S. Patent No. 5,796,542) entitled; Servo-track writer system having a plurality
6 of engaging pins co-axially rotated with head actuator pivot axes, Szeremeta, date of patent:
7 Aug. 18, 1998. An apparatus and method useful in a servo-track writer (STW) system for
8 simultaneous servowriting of tracks on disk surfaces in a plurality of disk drive head
9 assemblies (HDAs). The STW system includes a motor disposed to turn a drive shaft on a
10 shaft axis. The drive shaft is supported in a base air bearing and coupled to a rotatable
11 elongated push-tower apparatus such that shaft rotation causes rotation of the push-tower
12 apparatus on a STW bearing axis disposed coaxially with the shaft axis. The push-tower
13 apparatus includes an externally-fixed retroreflector displacement sensor and a plurality of
14 fixed HDA actuator arm engaging pins each disposed to engage one of a plurality of HDAs
15 mounted in alignment in a stationary HDA positioning apparatus. Push-tower rotation moves
16 each engaging pin into contact with a respective HDA actuator arm, moving the actuator arm
17 to a position that is determined by processing position information feedback from the push-
18 tower retroreflector displacement sensor. The rotatable push-tower apparatus is supported at
19 the end opposite the base air bearing by a self-aligning distal air bearing. The invention
20 coaxially aligns each HDA actuator arm pivot axis with the STW bearing axis and the
21 respective engaging pin axis to reduce head-positioning errors caused by retroreflector sensor
22 transmission error and supports the distal push-tower shaft with a self-aligning air bearing to
23 reduce head-positioning errors caused by friction noise.

1 AJ. U.S. Patent No. 5,706,148) entitled; Hard disk drive with kinematically mounted
2 disk platters, Faris, date of patent: Jan. 6,1998. A disk drive system (50) comprising a
3 spindle (52) having a circular outer perimeter (60) and an axis of rotation. The spindle
4 comprises a first boss (68), a second boss (70), and a third boss (72), each of which is spaced
5 around the circular outer perimeter of the spindle. Moreover, each of the bosses has an upper
6 support surface (68a, 70a, 72a). Lastly, the disk drive system comprises a disk (8b) abutted to
7 each of the upper support surfaces of each of the first, second, and third bosses.

8 AK. From (U.S. Patent No. 5,949,612) entitled; Low friction sliding hard disk drive
9 system, Gudeman et al, Sept. 7, 1999. A operationally contacting hard disk drive system has
10 reduced friction due to lower capillary adhesion between the disk surface and a transducer in
11 a substantially continuous sliding relationship with the surface. The disk surface has an
12 adhesion-reducing texture that includes a microscopic RMS roughness in a range between
13 about 1.5 and 5.5 nanometers, or a number of asperities having a mean plane to peak height
14 in a range between about 6 and 50 nanometers. The roughness may increase in a radially
15 graded fashion to compensate for the increased linear velocity and concomitant frictional
16 power loss near the outer diameter of the disk. It is important that the uppermost reaches of
17 the textured surface are smooth but not flat in order to obtain lasting low friction operation,
18 which is accomplished by constructing the surface with a highest approximately one percent
19 having an average radius of curvature in a range between 2 microns and 100 microns. An area
20 of the slider in apparent contact with the disk surface is preferably less than 1000 square
21 microns, and a ratio between this nominal area and the mean to peak height is less than 0.3
22 meters. The slider may also include a substantial thickness of partially wetting material in
23 contact with the disk, or may alternatively be textured with deep grooves or materials having

1 differing wear rates, in order to provide reduced frictional adhesion despite wear of the slider.

2 AL. From (U.S. Patent No.6,005,747) entitled; High capacity disk drive with two
3 stator windings, Gilovich, date of patent: Dec. 21, 1999. A hard disk drive apparatus is
4 disclosed which utilizes at least a pair of actuator assemblies each of which includes a
5 plurality of separate actuator arms and spacers stacked on a tubular sleeve which is bearing
6 on a stationary actuator shaft. The arms and spacers are preferably ceramic with head leads
7 and preamplifiers carried on the arm. Each actuator stack has heads oriented in one direction
8 to minimize the spacing between the hard disks.

9 AM. From (U.S. Patent No. 6,252,743) entitled; Read/write positioning arm with
10 interspaced amplifier chips, Bozorgi, date of patent: June 26, 2001. Amplifier chips for
11 heads in a disk drive are interspaced adjacent to junctions between actuator arms and
12 suspension arms that hold the heads. This allows decreased spacing between plural disks in
13 the drive system and accelerated data rates. This also decreases assembly steps and damage to
14 the chips as they are further removed from mechanical processes such as swaging that attach
15 the suspension arms to the actuator arms. Damage to the disks or chips during operation is
16 also averted, as the chips are removed from each other and from the rapidly spinning disk
17 surfaces with which the suspension arms and heads are proximate. The interspacing can also
18 improve performance characteristics of the preamplifier chips, which do not need to be made
19 as thin in order to fit between disks, decreasing costs and problems such as overheating of the
20 chips.

21 AN. From (U.S. Patent No. 6,633,457) entitled; Actuator assembly with orthogonal
22 force generation, Lin et al, date of patent: Oct 14, 2003. An actuator assembly for
23 positioning read/write heads above a data storage media comprises a pivotally mounted

1 carriage arm assembly with a voice coil and a magnetic device having a plurality of poles for
2 generating a magnetic field. The voice coil is positioned with its effective portions crossing
3 through the magnetic field to generate at least one pair of driving forces in a direction
4 substantially orthogonal to a seeking direction of the read/write heads. The carriage arm
5 driven by said pair of forces has substantially no reacting force generated onto the pivot so
6 that the servo bandwidth of the head positioning assembly can be improved and achieves a
7 high degree of head positioning accuracy.

8 AO. From (U.S. Patent No. 6,633,458) entitled; Rotary piezoelectric micro actuator
9 with an optimum suspension arrangement, Wu et al, date of patent: Oct 14, 2003. The
10 invention relates to a microactuator comprising a movable structure having a symmetric axis
11 about which the movable structure are divided into two parts which can produce the same
12 movement but in opposite directions; two active arms built with piezoelectric material; two
13 stationary structures to connect the two active arms at their two ends, respectively. The
14 invention also relates to a disk drive suspension which is incorporated with the
15 microactuator.

16 AP. From (U.S. Patent No. 6,611,396) entitled; Disk level servo write, Kermiche et
17 al, date of patent: Aug. 26, 2003. A method for assembling and operating a fixed media hard
18 disk drive using a disk or a stack of disks on which servo information is pre-written off the
19 drive spindle. The disks are subsequently mounted on the drive spindle and a set of
20 rotationally concentric "virtual tracks" for seeking and following in terms of said pre-written
21 servo tracks are defined. The use of the concentric virtual tracks assures minimal actuator
22 motion during drive operation and increases acceptable offtrack tolerances. The off-spindle,
23 pre-writing of the servo information increases the efficiency of the assembly operation and

1 reduces the clean room burden.

2 AQ. From (U.S. Patent No. 6,512,659) entitled; Disk drive actuator arm with micro
3 actuated read/write positioning, Hawwa et al, date of patent: Jan. 28, 2003. The present
4 invention is embodied in an actuator arm which is mounted to a primary actuator. The
5 primary actuator positions the actuator arm, with a read/write head mounted to the actuator
6 arm, across a data storage disk. The actuator arm comprises an inboard portion, an outboard
7 portion and a pair of bimorph actuators. The inboard portion has a longitudinal axis and is
8 attached to the primary actuator. The outboard portion has the read/write head mounted onto
9 it. The pair of bimorph actuators are deflectable together in a common direction and are
10 connected between the inboard and the outboard portions. Upon deflection of the bimorph
11 actuators in the same direction, the outboard portion is translated along an at least nearly
12 straight line transverse to the longitudinal axis of the inboard portion. This transverse motion
13 allows the read/write head to be kept substantially within a plane parallel to the surface of the
14 data storage disk, preventing damage caused by possible contact between slider and the disk
15 surface from rolling the slider due to out-of-plane motions. Further, the use of bimorph
16 actuators provide increased displacements of the read/write head. Also, since the head
17 displacement is not a function of microactuator's position along the actuator arm, the actuator
18 arm can be shorter, allowing for use in compact disk drives.

19 AR. From (U.S. Patent No. 6,618,217) entitled; System and method for determining
20 the position of a device, Heaton et al, date of patent: Sept. 9, 2003. A position sensor
21 includes a stationary platform and a moveable platform. The position sensor further includes
22 at least one beam coupling the moveable platform to the stationary platform. The at least one
23 beam includes piezoresistive material that is positioned to provide an indication of a

1 movement of the moveable platform relative to the stationary platform

2 AS. From (U.S. Patent No. 6,594,106) entitled; Adaptive servo estimator and
3 compensator for coil and carriage deformation in voice coil motor driven hard disk drive,
4 Serrano et al, date of patent: Jul. 15, 2003. A system and method for adaptively
5 compensating for real-time variations in mechanical dynamics of a head-positioning
6 assembly during track follow and seek operations. The head-positioning assembly includes a
7 voice coil actuator that positions a read/write head utilizing a coil and carriage in conformity
8 with an actuator control signal. Variations in resonant mode characteristics are anticipated in
9 real-time in accordance with measured temperature variations. These parametric variations
10 are translated in real-time by a state space model to determine a secondary velocity and
11 displacement of the read/write head during track follow and seek operations. In response to
12 this secondary velocity and displacement determination, the actuator control signal is
13 dynamically adjusted to compensate for the determined secondary head velocity and
14 displacement, thereby improving head positioning accuracy and increasing servo bandwidth.

15 AT. From (U.S. Patent No.6,621,649) entitled; Write-to-read switching improvement
16 for differential preamplifier circuits in hard disk drive systems, Jiang et al, date of patent:
17 Sept. 16, 2003. The present invention relates to a preamplifier circuit comprising a plurality
18 of amplifier stages coupled together and operable to consecutively amplify a signal associated
19 with a head of a hard disk drive. The preamplifier circuit further comprises a power delivery
20 circuit operably coupled to the amplifier stages and operable to provide power to the
21 amplifier stages in a substantially concurrent manner when the hard disk drive is transitioning
22 from a write state to a read state. In addition, the circuit comprises a control circuit operably
23 coupled to the amplifier stages, and operable to activate at least two of the plurality of

1 amplifier stages in a generally consecutive manner after the providing of power to the
2 amplifier stages. In the above manner a saturation of an output of the preamplifier circuit is
3 avoided by preventing substantially a propagation of glitches through the preamplifier circuit
4 and providing for a substantially fast write-to-read transition time.

5 AU. From (U.S. Patent No. 6,661,593) entitled; Servo information detection method
6 and disk apparatus using the same, Ashikaga et al, date of patent: Dec. 9, 2003. In a servo
7 information detection method and disk apparatus of the present invention, it is determined
8 whether a pattern of detection bits, detected from a vicinity of a servo sync mark of a disk,
9 matches with a given comparison bit pattern. A pattern of tolerance bits is changed based on
10 a location of the disk where the servo sync mark is detected, so that the matching between the
11 detection bit pattern and the comparison bit pattern is performed based on the changed
12 tolerance bit pattern.

13 AV. From (U.S. Patent No. 6,611,401) entitled; Glide head with a transverse contact
14 rail, Burga et al, date of patent: Aug. 26, 2003. A glide head includes two rails that run from
15 the leading end to the trailing end of the glide head and a transverse contact rail that is
16 orientated orthogonally to the two rails and is located at the trailing end of the glide head. The
17 two rails may contact the transverse contact rail or one or both may not extend to the
18 transverse contact rail. In addition, the channel region defined between the two rails and the
19 wing, if used, may be tapered so that they merge with the bottom surface of the transverse
20 contact rail. The transverse contact rail may extend beyond the two rails. The glide head flies
21 with a positive pitch which causes the transverse contact rail to be the closest area on the
22 glide head to the surface of a rotating disk being tested. Thus, the mechanical energy is
23 greatest when the transverse contact rail contacts a defect on a disk, and thus the transverse

1 contact rail is the active rail. Because the transverse contact rail extends across the width of
2 the glide head, the glide head may be stepped by large amounts when testing a disk, which
3 decreases testing time and increases throughput. In addition, the transverse contact rail may
4 extend from one side of the glide head to the other, and thus, the glide head may be used to
5 test both the inside diameter and outside diameter of a disk.

6 AW. From (U.S. Patent No. 6,624,981) entitled; Micrometric actuation, hard disk
7 read/write unit with a flexure and micro actuator formed in a monolithic body of
8 semiconductor material, Vigna, date of patent: Sept. 23, 2003. A hard disk read/write unit is
9 formed in a monolithic body of semiconductor material, including a suspension structure, a
10 coupling or flexure element integral with the suspension structure, and a microactuator,
11 integral with the coupling. The monolithic body has a first portion accommodating integrated
12 electronic components, and a second portion, accommodating the coupling and the
13 microactuator. The coupling is formed from a central region, accommodating the
14 microactuator; an annular region, separated from the central region by a first trench, and from
15 the suspension by a second trench; a first pair of suspension arms, extending between the
16 central region and the annular region, along a first axis; and a second pair of suspension arms,
17 extending between the annular region and the suspension structure, along a second axis
18 perpendicular to the first axis. The first and second pair of arms, with a reduced thickness,
19 impart to the coupling yielding for rotations around the first and second axes of the central
20 region.

21 AX. From (U.S. Patent No. 6,633,458) entitled; Rotary piezoelectric micro actuator
22 with an optimum suspension arrangement, Wu et al, date of patent: Oct 14, 2003. The
23 invention relates to a microactuator comprising a movable structure having a symmetric axis

1 about which the movable structure are divided into two parts which can produce the same
2 movement but in opposite directions; two active arms built with piezoelectric material; two
3 stationary structures to connect the two active arms at their two ends, respectively. The
4 invention also relates to a disk drive suspension which is incorporated with the
5 microactuator.

6 AY. From (U.S. Patent No.6,532,137) entitled; Head assembly, disk drive apparatus,
7 hard disk drive and method for manufacturing disk drive apparatus, Huang et al, date of
8 patent: Mar. 11, 2003. A disk drive head assembly enables adjustment of a center of gravity
9 of the head assembly of a depopulation version, while suppressing an occurrence of a
10 resonance frequency affecting the performance of the disk drive apparatus. The head
11 assembly for the data storage media includes: magnetic heads for reading/writing data
12 from/to the data storage media, arms to which the magnetic heads are attached, a pivot shaft
13 holder for supporting the arms, a coil for a voice coil motor extended from the pivot shaft
14 holder, and a counter weight provided at a predetermined position opposite to a coil for the
15 voice coil motor with respect to the pivot shaft holder.

16 AZ. From (U.S. Patent No. 6,655,002) entitled; Micro actuator for use in mass data
17 storage, or the like, and method for making same, Maimone et al, date of patent: Dec. 2,
18 2003. A microactuator, or micromotor, (60) and method for making it are presented such that
19 a symmetrical build up of material is performed on opposite sides of a substrate. This reduces
20 mechanical stresses in the device. In its construction, respective layers of circuit portions
21 (108, 110) are built on each side of the structure, thereby eliminating the need to stack
22 complex patterns. Stacking one complex pattern on top of a similar pattern is difficult
23 because the surface, which is the base for subsequent layers, is not flat. The photolithography

1 process that forms these patterns is not very forgiving to non-flat surfaces. Avoiding the
2 stacked layers also allows thicker conductors to be considered for each circuit. Thicker
3 circuits increase current carrying capacity, which in one of the key variables increase the
4 power of the micromotor.

5 BA. From (U.S. Patent No. 6,674,598) entitled; Radial positioning of data to improve
6 hard disk drive reliability, Smith, date of patent: Jan 6. 2004. To optimize the life of a
7 magnetic disk data storage device it is recognized that the accessing of data on the disk data
8 surface should mimic the varying effective lubricant protection over the disk surface. The
9 lubricant applied to the disk data surfaces migrates outward during drive operation. To match
10 the disk surface protection to the frequency of data accesses at the storage locations, the
11 stored data files are periodically examined to determine how recently access has occurred and
12 the number of accesses during a most recent fixed period to determine whether the data file is
13 to be stored in radially inner or radially outer portions of the band of concentric data tracks.
14 By thus allocating the data file storage location, the data is accessed and intermittent contact
15 between disk surface and transducer carrying slider occurs with greatest frequency where the
16 lubricant coating is least depleted and most robust.

17 The Applicant and his attorney submit that the above-cited references taken alone or
18 in combination neither anticipate nor render obvious the present invention. None of the
19 references disclose or claim a hard disk drive system made of at least two pairs of actuator
20 and suspension arm assembly mechanism and which are operably coupled to multiple
21 read/write heads there-under and there-upon. Where these have concurrent access to two
22 quadrants of the disk platter surface on both upper and lower sides of the platters and are
23 moveable on two linear paths (as opposed to the prior art single one curved path) by the voice

1 coil motors (as opposed to the prior art single one curved path.)

2 Where the actuators and suspension arm assemblies on the opposite sides, remain
3 parallel to each other at each quarter, but cover different data tracks on each of the other
4 opposite quarter areas of the platter – at that instant of the platter spin point in time. Hence,
5 high speed spin becomes unnecessary. Where the plurality of actuators and suspension
6 assemblies on two opposite sides of said quarters, have considerably higher number of R/W
7 heads fixed there - under which enables to access a multiple set of adjacent data tracks and
8 continuous data sectors – even as the actuator arm assembly remains unmoved for a certain
9 period.

10 The R/W heads work in coordination; resulting in the minimization of the distance of
11 each actuator and suspension arm assembly stroke distance and hence changing the
12 coordinates of the R/W heads coupled there-under and there-upon, to a substantially shorter
13 distance. This keeps each one of the components – part of the pair actuator and suspension
14 arm within a minimized limited range of back and forth motions.

15 Said access to a multiple set of data tracks and continuous data sectors is a function of
16 the sum of the larger area of actuator arm and suspension assemblies, that have the R/W
17 heads fixed there-under symmetrically - with equal distances between them. These R/W
18 heads are in conformity to the curve-linear approach angle of the data tracks. (Even as
19 actuator arm remains unmoved for a certain time period.)

20 The above mentioned feature enables micro-actuation and servo control functions
21 when voice coil motor motion is in the digital mode for precision. It switches to analog mode
22 when data tracks that have to be accessed which are not adjacent and far apart. Switching
23 between digital and analog is frequent as both adjacent and non-adjacent data tracks are

1 reached.

2 Hence, a set of multiple data tracks reach R/W heads; instead of moving the R/W to
3 a set of adjacent data tracks – data tracks reach the R/W head fixed onto said actuator arm
4 and suspension assembly. Instead of having to move the actuator back and forth to access
5 data tracks for even close proximity and adjacent data tracks, as it is with the prior art.

6 The RPM of the platter can thereby be kept at lower rates of 5000 RPM and 7500
7 RPM; as the two pairs of actuators and suspension assemblies enable lower spin rates for the
8 drive to R/W a given amount of data within a shorter time – despite a lower RPM.

9 Furthermore, said distance of actuator motion is shortened for each one of the actuator
10 and suspension assemblies, relative to the prior art straight arm actuator swings; where the
11 actuator has to cover a longer distance between the outer most data tracks and inner most data
12 tracks, and which is limited to only a few R/W heads fixed thereon as a consequence of the
13 geometric shape of the straight arm actuator.

14 Therefore, the space needed for the voice coil motors is approximately one half of the
15 voice coil motor space needed of a prior art multiple straight arm actuator – as a function of
16 the considerably shortened distance of the minimized range motions of the actuator and
17 suspension assemblies of this invention.

18 The concurrent full stroke access to multiple data tracks and uninterrupted data
19 sectors enables a substantial shortening in seek - read and write times and makes it
20 instantaneous.

21 Invention system also provides simultaneous access to a set of multiple data tracks
22 and enable continuity of accessing data sectors without interruption of the R/W functions and
23 thereby enables parallel data transfer capability.

1 Furthermore, the parking function is made more reliable by avoiding R/W head
2 landing; as one continuous contact micro – pad(s) per two R/W heads are utilized to keep
3 the micro distance of the R/W heads constant and thereby avoid head ding and physical
4 contact with the platter surface, when read/write heads are in the parking mode.

5 The listed references relate only to the general field of the disclosure and do not
6 constitute an admission that the references are relevant or material to the claims; they are
7 cited only as constituting the closest art of which the Applicant and his attorney are aware.

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9 constitute an admission that the references are relevant or material to the claims; they are
10 cited only as constituting the closest art of which the Applicant and his attorney are aware.

11
12 Respectfully submitted,

13 DEAN A. CRAINE

14 Reg. No. 33,591, Attorney for Applicant

15 Cc. Fikret M. Zabtcioglu (Sole inventor.)

